

KANCHRAPARA COLLEGE  
Department of Sanskrit -Honours

Programme Specific Outcomes

- Reading: Students will become accomplished active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- writings: Students will be able to write Devnagari Scripts.
- Culture and History: Students will gain a knowledge of the major traditions of literatures written in Sanskrit.
- Research Skills: Students will be able to identify topics and formulate questions for productive inquiry.
- Oral Communications: Students will demonstrate the skills needed to participate in conversation that builds knowledge collaboratively.
  - Sanskrit as a Career Option: Sanskrit is recognized as “mother of all languages” throughout the greater portion of the world. Even if you aiming for a bright career only, Sanskrit can provide it, till today. Harvard of Cambridge oxford to Trinity college Dublin – can end up with a faculty post in some highly ranked universities,
  - Mode of Hindu Survival : Sanskrit and only Sanskrit is the language which should bubbles up in our mind even if we merely think about Hindu Survival. □ Practical Advantages: If someone does not know Sanskrit he is obviously missing something. He cannot get the clear perspective of Vedas, Geeta, Upanishads, Ramayana, Mahabharata, Arthashastra and many the books, which are till regarded as the finest piece by a large portion of our society.
  - One step Towards Spiritual upliftment: We need to keep in mind that it has a perfect grammar and nicely built structure.

Chapter-Specific Course Questions:

Classical Sanskrit Literature: (Poetry )

- Display a working knowledge of the genres of fiction, poetry, and drama by writers from various cultures and historical eras.
- Identify and describe distinct characteristics of literary texts.
- Analyze literary works for their structure and meaning.
- Effectively communicate ideas related to the literary works during class and group activities.
- Identify and describe distinct literary characteristics of poetic forms. □ Analyze poetic works for their structure and meaning, using correct terminology. □ Effectively communicate ideas related to the poetic works during class and group activities.

Classical Sanskrit Literature (Prose and Story) :

- Display a working knowledge of the prose as a literary genre.
- Identify and describe distinct literary characteristics of the prose.
- Reading Sanskrit Prose and story they can gain various moral value. □ They will

be able to engage a wider variety of people in conversation and in turn improve their knowledge and conversation skill.

#### GITA (SELE MANAGEMENT IN THE GITA) :

- This teaching are considered to be ultimate It encompasses each and every aspect of life. One surly can lead a peaceful life if the teaching of Gita are followed. □ The primary purpose of Gita is to illuminate for all of humanity the realization of the true nature of divinity.
- The Gita talks a lot about meditation and its importance.
- Students can develop their personality of godhead is the ultimate support of any human being.
- They learn that what they have as everything would be left over here in this material world we won't be able to take anything with us.

#### Poetics and literary criticism:

- Students can applies as a term to any argumentation about literature, whether or not specific works are analyzed.
- They learn many notable works of criticism combine discussions of texts with broad arguments about the nature of literature and the principles of assessing it. □ Criticism will help the students to cover all phases of literary understanding. □ Students can evaluate and interpeat of a topic.

#### Indian Social Institutions and Polity :

- Students can learn that king created from eternal particles of main demigods. □ They can learn relationship to brahmanas, results of money given to brahmanas. □ Students also learn taxes maintain and protect brahmanas, brahmanas activities increase kings life.
- They learn war strategy, pleasure and duty.
- They can learn how British were successful in overpowered India, after Mughals were weakened.
- One must also know how Indian education system Gurukul System was overtaken by convert school culture under a well drafted plan to produce Indians who thinks and behave like Englishman.

#### Indian Epigraphy and Chronology:

- Understand the social conditions.
- Students will be able to know political career of samudragupta and the kingdoms conquered by him.
- Understand the education and learning system during these respective times.
- Understand the economic life of the past.
- Student will be able to write different scripts.
- They can be undertaken on more detailed basis of different regions and various languages.

#### Modern Sanskrit Literature:

- Reading the modern Sanskrit literature students mind revived its old interesting thirst. □

Marked by a strong and intentional break with tradition. This break includes a strong reaction against established religious political and social views.

Vedic Literature:

- Students can learn vedic agriculture in Ancient India.
- They can analyze between women's education in ancient India and modern education system.
- They came to know vedic society, vedic age society, vedic culture and tradition.  Origin of caste system in India.

Sanskrit Grammar:

- Learning the Sanskrit Grammar they clearly communicate in Sanskrit.  Learning the proper grammar they express their thoughts and ideas.  They can write and speak correctly.
- They gain the knowledge of Sutra, Vartika, Bhasya, Smaso, Karaka etc.  Analyzing the Paninian Grammar.

Linguistics:

- Comparison of different languages.
- Understand that language in an historical context.
- They can learn what the culture finds important or unimportant, its history, its expectations, its fears and its hopes.
  - It gives a deeper understanding of the language through its history, development etc.

Indian Ontology and Epistemology :

- A conceptual perspectives that human behaviors and actions are largely determined by stimuli which are not of their own making.
  - The relevance of the emergence of debate for philosophical activity in India.
  - The significance of epistemology in Indian philosophy and the sense in which religion is involved in it.
- An attempt to extract some intercultural aspects of the history of Indian Philosophy. -

## **Department of ECONOMICS -Honours**

### **Programme Specific Outcome: Economics Honours**

The course of Economics honours primarily equips the students to understand the world around them, to further pursue their higher studies in renowned institutions, to apply for competitive examinations and also to enter the corporate job market with a fair amount of confidence.

### **Knowledge Formation:**

Belonging to the club of social science subjects, Economics primarily teaches students to carefully study complex human behaviour, the outcomes of their socio-economic and political interactions, various social problems and policy debates.

- The study of Microeconomics - fundamental aspect of economic discours - enables them to critically analyze how individuals, businesses, governments and societies at large make decisions and allocate scarce resources to achieve various important goals and eventually augment their well-being.
- It trains students to engage with ideas, concepts and debates concerning the knowledge of how people make rational decisions in their everyday life and how to identify inherent irrational tendencies of human behavior.
- Students are introduced to some of the most prominent economic problems faced by a country such as unemployment, inflation, lack of economic growth and so on. As they learn intensively and extensively about macroeconomic theories and debates, they become well-aware of the complexities involved and are well-equipped to form their own understanding of the matter. This not only helps them in their higher studies (masters programme) but also for both future research and enhancement of their future prospects as economic analysts.
- Courses related to Macroeconomics, Development Economics and Indian Economy are aimed at training the students to critically analyze pressing issues like poverty, inequality, unemployment, inflation, climate change, societal injustice etc.
- Economics is a policy-oriented science. The three-year degree programme therefore imparts the capability of debating alternative policy measures to address various developmental problems and equips the students with the tools and techniques to critically appreciate various government policies. Courses including Macroeconomics and Public Finance become extremely relevant in this regard.
- In today's globalized world characterized by deeply interconnected local, national and international markets, the knowledge of various papers such as Macroeconomics, Microeconomics and International Trade enables the students to comprehend the ever-deepening complex economic dynamics of the world economy.
- Climate change being one of the biggest challenges of the 21st century is a matter of both academic and political engagements. The problem undeniably has an economic root and thus courses such as environmental economics and development economics present both fundamental theoretical as well as empirical issues and nuances related to the climate crisis and the complex policy debates around it.
- After completion of the three-year honours course in Economics students are expected to read the books written by various famous Economists to learn and engage with the original scholastic works. This should also help promote enthusiasm and interest to do progress in research works and to write articles on various Economic topics. To develop critical thinking capabilities, to inspire others to study Economics.

### **Higher Studies and Job Prospect:**

- Apart from imparting theoretical understanding of the economic and social world at large the course further aims to enhance the real-life problem-solving skills of the students.
- As part of the degree programme students are introduced to various oft-cited and most-reliable (government and private) data sources and are taught how to access relevant economic data. Additionally, they are taught to execute data analysis using Microsoft Excel.
- The economics honours course thus aims at expanding the career opportunities for the students in today's highly competitive world so that after the completion of the graduation programme they can go on to higher studies in Economics in different reputed institutions.
- With the growing importance of finance in terms of its contribution to the overall economy as well as to job opportunities, courses such as Monetary and Financial Economics are of extreme importance for the students.
- The students are introduced to research in Economics since they, as part of the degree programme, have to submit a dissertation. This not only expands their horizon of knowledge but also develops their understanding and interest in research work, in turn contributing to broadening their future prospects. Most importantly, it specifically enhances their analytical and writing skills.

#### **Contribution to Society:**

- It is of utmost importance that students learn about their own country and her problems so that they can in their own capacity contribute to the collective efforts of finding effective solutions. Through courses on both Development Economics and Indian Economy students are exposed to theoretical knowledge as well as empirical evidence concerning the problems faced by developing countries and India in particular. They also get the opportunity to comprehend and debate various policy measures in this respect.

Above all, the knowledge of Economics plays a pivotal role in creating well-informed citizens to ensure and accelerate progressive socio-economic and political changes. The course therefore also envisages toward broader goals such as nation building.

#### **Department of Chemistry**

#### **Programme Specific Outcomes (PSO) of Chemistry Honours:**

The three year Under Graduate course in Chemistry Honours initiates students to groom the conception so that they can use their perseverance to provide innovative ideas in various fields to make our country proud. After successfully completing the 3 year degree course the following Programme Specific Outcomes are expected of the students:

PSO1: After completion of the three-year honours course in Chemistry students are expected to acquire clear cut knowledge about various disciplines of Chemistry and capable to get briefidea on any topic of chemistry that are written in different books and journals. It will help them for future purpose regarding research works which includes innovative thinking and writing skill.

PSO2: To be able to face any kind of challenges regarding theoretical and practical knowledge. They will be able to find proper pathway to solve the corresponding problemsand also help others to learn how to make a way out of the challenges.

PSO3: To be up to date regarding the progress of the subject and learn how to cope up with worldwide developments of new visions.

PSO4: To learn and understand the different methods and proposals regarding theoretical and practical issues, understanding their significance and applying them in the relevant areas.

PSO5: To acquire perfect skills to handle different equipments and instruments regarding practical works and will be able to act as mentors for others to develop such skills.

PSO6: To be able to develop new methodologies regarding practical works and make them suitable for academia as well as industry and so the outcomes will be beneficial for the society in broader perspective.

PSO7: To be able to search relevant works and compare them with their own so that the outcomes can provide various outlooks and open the window for new innovative thinking.

PSO8: To recognize and understand philosophical matters of the subject that enhances the depth of the knowledge and make suitable platform to guide others to acquire the same.

PSO9: To be able to make logical arguments regarding multidisciplinary fields of chemistry and be open minded to discuss different areas.

PSO10: To be able to identify inherent problems and shortcomings in reading Chemistry and to provide suitable views to minimize the problems as far as possible.

PSO11: Chemistry is related with multidisciplinary fields such as fundamental science, material science, bio science etc. Students are expected to cover those different fields so th

they can develop their own field regarding research purpose in future instead of getting simple stereotype knowledge.

PSO12: To develop a true scientific mind which is very crucial since that will lead them to be an excellent teacher cum philosopher cum a perfect human being.

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## **SUBJECT – PHYSICS (Honours)**

### **PROGRAMME SPECIFIC OUTCOMES & COURSE OUTCOMES**

#### **PROGRAMME SPECIFIC OUTCOMES [PSO]:**

**PSO1:** Students are expected to acquire core knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory, electronics, optics, special theory of relativity and modern physics.

**PSO2:** Students are also expected to develop written and oral communication skills in communicating physics-related topics.

**PSO3:** Students should learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.

**PSO4:** Students will develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.

**PSO5:** Students will understand the fundamentals of computer programming and will learn the applications of numerical techniques for modeling physical systems for which analytical methods are inappropriate or of limited utility.

**PSO6:** Students will realize and develop an understanding of the impact of physics and science



on society.

**PSO7:** Apply conceptual understanding of the physics to general real-world situations.

**PSO8:** Describe the methodology of science and the relationship between observation and theory.

**PSO9:** Learn to minimize contributing variables and recognize the limitations of equipment.

**PSO10:** Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.

**PSO11:** Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.

**PSO12:** Analyze physical problems and develop correct solutions using natural laws

## COURSE OUTCOMES [CO]:

Semester	Course code	Course	Course Outcome
I	PHY – H- CC-T-01	Mathematical Physics – I	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Revise the knowledge of calculus, vectors, vector calculus. These basic mathematical knowledge is essential for solving problems in various branches of physics</li> <li>• Learn various techniques of solving 1<sup>st</sup> &amp; 2<sup>nd</sup> order linear differential equations</li> <li>• Apply the concept of Gradient, Divergence and Curl of vector field</li> <li>• Realize importance of Green, Gauss and Stokes’s theorem</li> <li>• Understand the concept of orthogonal curvilinear coordinate system and properties of Dirac delta function.</li> </ul>
I	PHY – H- CC-T-02	Mechanics	<ul style="list-style-type: none"> <li>• On successful completion of the course, students will be able to:</li> <li>• Understand laws of motion and their application to various dynamical situations, notion of inertial frames and concept of Galilean invariance.</li> <li>• Understand the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.</li> <li>• Understand the analogy between translational and rotational dynamics, and application of both motions simultaneously</li> <li>• Acquire knowledge on moment of inertia about the given axis of symmetry for different uniform mass distributions.</li> <li>• Understand the phenomena of collisions and idea about center of mass and laboratory frames and their correlation.</li> <li>• Understand the principles of elasticity through the study of Young Modulus and modulus of rigidity.</li> <li>• Understand simple principles of fluid flow and the equations governing fluid dynamics.</li> <li>• Apply Kepler’s law to describe the motion of planets and satellite in circular orbit, through the study of law of Gravitation.</li> </ul>

			<ul style="list-style-type: none"> <li>• Explain the phenomena of simple harmonic motion and the properties of systems executing such motions.</li> <li>• Describe how fictitious forces arise in a non-inertial frame</li> <li>• Describe special relativistic effects and their effects on the mass and energy of a moving object.</li> <li>• Perform experiments related to the course to acquire better understanding about the course as well as to develop skill.</li> </ul>
II	PHY – H- CC-T-03	Electricity and Magnetism	<p>On successful completion of the course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Solve problems involving linear electrical networks using the symmetry concept and/or various network theorems.</li> <li>• Have gained knowledge on various theorems/laws of electrostatics, dielectric properties of matter and solve variety of relevant problems.</li> <li>• Have in-depth knowledge of transient current responses of LR, CR, LCR circuits.</li> <li>• Learn complex reactance &amp; impedance for AC circuits, Series LCR circuit: resonance, power dissipation, Q-factor, band width and solve variety of relevant problems.</li> <li>• Learn Biot-Savart law, Ampere’s law, Faraday’s law of electromagnetic induction and solve variety of relevant problems.</li> <li>• Perform several experiments related to the course for better understanding and developing skill.</li> </ul>
II	PHY – H- CC-T-04	Waves and Optics	<p>On successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand SHM, various types of superposition of SHMs, formation of Lissajous figure and its demonstration by mechanical and electrical methods.</li> <li>• Solve differential equation of free, damped and forced oscillations.</li> <li>• Calculate logarithmic decrement, relaxation factor and quality factor of a harmonic oscillator.</li> <li>• Understand energy relations, velocity and amplitude resonance, sharpness of</li> </ul>

			<p>resonance, power dissipation, band width, Q-factor.</p> <ul style="list-style-type: none"> <li>• Solve general equation of wave motion, longitudinal waves in fluids, progressive &amp; stationary waves, phase and group velocity, energy propagation.</li> <li>• Know about the acoustical terms like sound intensity, loudness, intensity level, Bel, decibel, phon.</li> <li>• Understand vibration of stretched string: Plucked &amp; Struck.</li> <li>• Gain knowledge on various theories of light.</li> <li>• Use principles of wave motion and superposition to explain interference, diffraction and polarization of light.</li> <li>• Perform experiments related to the course for better understanding.</li> </ul>
III	PHY – H- CC-T-05	Mathematical Physics – II	<p>On successful completion of the course student are expected to understand the following and solve related problems:</p> <ul style="list-style-type: none"> <li>• Fourier transforms with examples of trigonometric, Gaussian, finite wave train &amp; other functions.</li> <li>• Various special functions and their applications</li> <li>• Grasp the concept of Partial Differential equation and its application</li> <li>• Learn the beta, gamma and the error functions and their applications in doing integrations.</li> <li>• Know about the basic theory of errors, their analysis, and estimation with examples of simple experiments in Physics.</li> </ul>
III	PHY – H- CC-T-06	Thermal Physics	<p>On successful completion of the course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Become familiar with various laws of thermodynamics, thermodynamic process, conversion of heat into work, Heat engines, concepts of entropy.</li> <li>• Solve problems involving entropy changes in a wide range of processes and determine the reversibility and irreversibility of a process from such calculations.</li> <li>• Realize the importance of thermodynamic</li> </ul>

			<p>potential functions and applications of Maxwell's relations.</p> <ul style="list-style-type: none"> <li>• Understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems.</li> <li>• Gain knowledge in kinetic theory of gas.</li> <li>• Acquire knowledge on Maxwell-Boltzman law of velocity distribution in ideal gas, collision probability, Transport phenomenon like viscosity, thermal conductivity, diffusion.</li> <li>• Learn behavior of real gases, Joule-Thomson effect.</li> <li>• Perform experiments related to the course for better understanding</li> </ul>
III	PHY – H- CC-T-07	Digital Systems and Applications	<p>After successful completion of the course the student is expected to be conversant with the following:</p> <ul style="list-style-type: none"> <li>• The need and advantages of Digital Circuits.</li> <li>• The basics of number system and their arithmetic operations.</li> <li>• Synthesis of Boolean functions, simplification / minimization techniques and realization of digital circuits by employing Boolean algebra.</li> <li>• Basic working of an oscilloscope including its different components and to deploy the same to study different wave forms and to measure voltage, current, frequency and phase.</li> <li>• Secure first-hand idea of different components including both active and passive components to gain an insight into circuits using discrete components and also to learn about integrated circuits.</li> <li>• Fundamental logic gates, combinational as well as sequential circuits.</li> <li>• Detailed idea on different types of Flip Flop. Their uses in design of Shift registers, Counters and timers.</li> <li>• Application and use of Counters, Shift Registers and Timers in real world.</li> <li>• Fundamentals of Computer Architecture and Organization. Basic Idea of Control System, Input – Output Devices, Memory</li> </ul>

			<p>mapping and Memory Organization</p> <ul style="list-style-type: none"> <li>To design and implement both combinational circuits and sequential circuits by employing NAND as building blocks and demonstrate Adders, Subtractors, Flipflops, Shift Registers and Multivibrators using 555 ICs in the laboratory.</li> </ul>
III	PHY – H- SEC-T-01	Electrical circuits & Network skills	<p>At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>Learn the importance of basic electrical equipment's such as ammeter, voltmeter, galvanometer etc. in daily life.</li> <li>Learn difference between AC and DC circuits.</li> <li>Learn electrical drawing and use of electrical components.</li> <li>To have hands-on experience on electrical tools.</li> <li>Know the information about electrical protection.</li> </ul>
IV	PHY – H- CC-T-08	Mathematical Physics – III Credit - 6	<p>On successful completion of the course student are expected to understand the following and solve related problems:</p> <ul style="list-style-type: none"> <li>Complex numbers, Euler's formula, De Moivre's theorem, function of complex variables, Cauchy-Rieman conditions, analytic functions, singular functions, Cauchy inequality, Cauchy integral formula, Laurent and Taylor's expansion, residue and residue theorem.</li> <li>Fourier transforms with examples of trigonometric, Gaussian, finite wave train &amp; other functions.</li> <li>Laplace Transforms, its properties and applications to Differential equations and other physical problems</li> </ul>
IV	PHY – H- CC-T-09	Elements of Modern Physics	<p>At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>Know main aspects of the inadequacies of classical mechanics and understand historical development of quantum mechanics and ability to discuss and interpret experiments that reveal the dual</li> </ul>

			<p>nature of matter.</p> <ul style="list-style-type: none"> <li>• Understanding the properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.</li> <li>• Understand fission and fusion well as nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.</li> <li>• Understand various interactions of electromagnetic radiation with matter. Electron positron pair creation.</li> <li>• Understand the spontaneous and stimulated emission of radiation, optical pumping and population inversion. Three level and four level lasers. Ruby laser and He-Ne laser in details. Basic lasing</li> </ul>
IV	PHY – H- CC-T-10	Analog Systems and Applications	<p>On successful completion of the course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Acquire knowledge on working mechanism of various semiconductor devices like diodes, photodiode, LED, solar cell rectifiers, transistors (BJT &amp; FET) etc and their various applications.</li> <li>• Gain knowledge on h-parameters of transistor.</li> <li>• Design of Amplifier of specific gain and troubleshooting.</li> <li>• Employ transistor as a switching device.</li> <li>• Gain detailed knowledge on OP-AMP and its versatile applications.</li> <li>• Understand the mechanism of feedback amplifier and oscillator.</li> <li>• Design of oscillator of specified frequency and troubleshooting</li> </ul>
IV	PHY – H- SEC-T-02	Renewable Energy and Energy Harvesting	<p>On successful completion of the course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Get an idea about various types of non-conventional energy sources.</li> <li>• Learn the energy harvesting procedure from solar energy, wind energy, ocean, geothermal, hydro, piezoelectric and electromagnetic energy</li> </ul>
V	PHY – H- CC-T-11	Quantum	At the end of the course, the student will be able

		Mechanics and Applications	<p>to:</p> <ul style="list-style-type: none"> <li>• After an exposition of inadequacies of classical mechanics in explaining microscopic phenomena, quantum theory formulation is introduced through Schrodinger equation.</li> <li>• The interpretation of wave function of quantum particle and probabilistic nature of its location and subtler points of quantum phenomena are exposed to the student.</li> <li>• Study of influence of electric and magnetic fields on atoms will help in understanding Stark effect and Zeeman Effect respectively.</li> <li>• The experiments using Sci-lab will enable the student to appreciate nuances involved in the theory.</li> <li>• This basic course will form a firm basis to understand quantum many body problems.</li> </ul>
V	PHY – H- CC-T-12	Solid State Physics	<p>At the end of the course, the student are expected to understand the following:</p> <ul style="list-style-type: none"> <li>• A brief idea about crystalline and amorphous substances, about lattice, unit cell, miller indices, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.</li> <li>• Knowledge of lattice vibrations, phonons and in depth of knowledge of Einstein and Debye theory of specific heat of solids.</li> <li>• Knowledge of different types of magnetism from diamagnetism to ferromagnetism and hysteresis loops and energy loss.</li> <li>• Understanding above the band theory of solids and must be able to differentiate insulators, conductors and semiconductors.</li> <li>• Understand the basic idea about superconductors and their classifications.</li> </ul>
V	PHY – H- DSE -T-01	Classical Dynamics	<p>On successful completion of the course, students are expected to understand the following and solve related problems:</p> <ul style="list-style-type: none"> <li>• Motion of charged particle in electric &amp; magnetic field (for both crossed fields &amp; parallel fields), generalized coordinates &amp; velocities, Lagrangian and Hamiltonian formulation, canonical transformation and</li> </ul>



			<p>Poisson's bracket.</p> <ul style="list-style-type: none"> <li>• Small amplitude oscillation, point of stable equilibrium, expansion of PE around the minimum, normal modes of oscillation.</li> <li>• Fundamentals of fluid dynamics: continuity equation, Poiseuille's equation, Navier-Stoke's equation, turbulence.</li> <li>• Special theory of relativity: Postulates, Lorentz Transformations, Minkowski space, space-time diagram, Time-dilation, length contraction and twin paradox, four-vectors: space-like, time-like and light-like. Four-velocity and acceleration. Minkowski Space. Four-momentum and energy-momentum relation. Doppler effect from a four-vector perspective. Concept of four-force. Conservation of four-momentum. Relativistic kinematics. Application to two-body decay of an unstable particle.</li> </ul>
V	PHY – H- DSE -T-02	Nuclear and Particle Physics	<p>At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Learn the ground state properties of a nucleus – the constituents and their properties, mass number and atomic number, relation between the mass number and the radius and the mass number, average density, range of force, saturation property, stability curve, the concepts of packing fraction and binding energy, binding energy per nucleon vs. mass number graph, explanation of fusion and fission from the nature of the binding energy graph.</li> <li>• Learn about the process of radioactivity, the radioactive decay law, the emission of alpha, beta and gamma rays, the properties of the constituents of these rays and the mechanisms of the emissions of these rays, outlines of Gamow's theory of alpha decay and Pauli's theory of beta decay with the neutrino hypothesis, the electron capture, the fine structure of alpha particle spectrum, the Geiger-Nuttall law, the radioactive series.</li> <li>• Learn the basic aspects of nuclear reactions, the Q-value of such reaction and</li> </ul>

			<p>its derivation from conservation laws, The reaction cross-sections, the types of nuclear reactions, direct and compound nuclear reactions, Rutherford scattering by Coulomb potential.</p> <ul style="list-style-type: none"> <li>• Learn some basic aspects of interaction of nuclear radiation with matter- interaction of gamma ray by photoelectric effect, Compton scattering and pair production, energy loss due to ionization, Cerenkov radiation.</li> <li>• Learn about the detectors of nuclear radiations- the Geiger-Mueller counter, the scintillation counter, the photo-multiplier tube, the solid state and semiconductor detectors.</li> </ul>
VI	PHY – H- CC-T-13	Electromagnetic Theory	<p>After successful completion of the course the student is expected to be conversant with the following:</p> <ul style="list-style-type: none"> <li>• Achieve an understanding of the Maxwell's equations, role of displacement current, gauge transformations, scalar and vector potentials, Coulomb and Lorentz gauge, boundary conditions at the interface between different media.</li> <li>• Apply Maxwell's equations to deduce wave equation, electromagnetic field energy, momentum and angular momentum density.</li> <li>• Analyze the phenomena of wave propagation in the unbounded, bounded, vacuum, dielectric, guided and unguided media.</li> <li>• Understand the laws of reflection and refraction and to calculate the reflection and transmission coefficients at plane interface in bounded media.</li> <li>• Understand the linear, circular and elliptical polarisations of electromagnetic waves. Production as well as detection of waves in laboratory.</li> <li>• Understand propagation of electromagnetic waves in anisotropic media, uni-axial and biaxial crystals phase retardation plates and their uses.</li> <li>• Understand the concept of optical rotation,</li> </ul>

			<p>theories of optical rotation and their experimental rotation, calculation of angle of rotation and specific rotation.</p> <ul style="list-style-type: none"> <li>• Understand the features of planar optical wave guide and obtain the Electric field components, Eigen value equations, phase and group velocities in a dielectric wave guide.</li> <li>• Understand the fundamentals of propagation of electromagnetic waves through optical fibres and calculate numerical apertures for step and graded indices and transmission losses.</li> </ul>
VI	PHY – H- CC-T-14	Statistical Mechanics	<p>Successful completion of the course, helps students develop concepts in :</p> <ul style="list-style-type: none"> <li>• Classical laws of thermodynamics and their application, postulates of statistical mechanics, statistical interpretation of thermodynamics, Microcanonical, Canonical and Grand canonical ensembles</li> <li>• The quantum statistical distributions, viz., the Bose-Einstein statistics and the Fermi-Dirac statistics.</li> </ul>
VI	PHY – H- DSE -T-03	Communication Electronics	<p>After successful completion of the course the student is expected to be conversant with the following:</p> <ul style="list-style-type: none"> <li>• Electromagnetic spectra and different frequency bands.</li> <li>• Comparison between Analog and Digital Communications Techniques. Benefits and limitations of Digital Communication</li> <li>• Concepts of Modulation and needs, Different types of modulation (Both analog and Digital) and their benefits and limitations, super heterodyne receivers.</li> <li>• Concept of sampling, sampling theorem and time division multiplexing.</li> <li>• Digital transmission, encoding and decoding.</li> <li>• Mobile communication/telephony and concepts of Cellular Network.</li> <li>• Uplink/Downlink, Handover, Cell Selection Techniques and different Subsystems of Cellular Network.</li> </ul>

			<ul style="list-style-type: none"> <li>• 2G, 3G, 4G and 5G (Qualitative Discussion). Multiple Access Technologies (TDMA / FDMA / CDMA ).</li> <li>• Concepts of Satellite Communication. Concepts of transponders, different Sub Systems, positioning and orbits.</li> <li>• Apply the theory that they have learned in the theory class to gain hands on experience in building modulation and demodulation circuits; Transmitters and Receivers for AM and FM. Also to study TDM, PAM, PWM, PPM and ASK, PSK and FSK modulator and verify their results.</li> </ul>
VI	PHY – H- DSE -T-04	Biophysics	<p>On successful completion of the course, students are expected to understand the following :</p> <ul style="list-style-type: none"> <li>• Structure of living state, living state interactions and domain of physics in biology</li> <li>• Heat transfer mechanism in biomaterials and living state thermodynamics</li> <li>• Concept of chemical thermodynamics and different types of free energy</li> <li>• Diffusion, Transport phenomena and fluid dynamics</li> <li>• Concept of Bioenergetics and Molecular motors</li> </ul>